Examination of the current Deprivation of Human Capital Across the Globe

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1. Abstract

This paper examines the World Wide depravation of Human Capital. Human Capital as measured in three parameters: Education, Health and Income. The examination takes place using two different but complementing approaches. The first approach calculates the overall level Human Capital depravation. The Second approach examines the stock of Human Capital on a per country basis. The combined approach determines how deprived the world is and what distribution deprivation follows. It will further show that nearly a third of the world is currently deprived of proper Human Capita. There after it will provide insight on how Education is the most influential factor leading to this deprivation.

2. Introduction

This paper examines Human Capital at a global scale. It does so by considering a holistic approach to Human Capital. It includes three main categories; Health, Education and Income. These categories have been predominant throughout literature as proxies a country's Human Capital Stock. These categories then break down into sub-categories that can be observed and measured. Further discussion on the categories chosen can be found in the Categories Section.

The analysis takes on two parts. It first looks at the global situation by calculating a Multidimensional Human Capital Index (MHCI). This is based on the approach done by the United Nations

Development Program to Calculate the Multidimensional Poverty Index (MPI). This approach looks at the different sub-categories specified and determines which countries are deprived for each one. This approach determines the total level of Global Human Capital deprivation.

The second part of the analysis looks at a Weighted Average Index. The index is a measure of the spread in Human Capital across countries. It provides insight into the distribution of Human Capital Stock among nations, especially between developing and developed countries.

In the interest of correct communication it is fundamental to properly define Human Capital. Adam Smith offers a simple definition; he says "Human Capital is … the acquired and useful abilities of all the inhabitants or members of the society" (Smith). It is easy to see then, how human capital is one of the most important factors of production.

Additionally, humans are the actors that take command of all economic activity. They are simultaneously in charge of production, consumption and transaction. Furthermore, they are also in control of all decisions pertaining to the factors of production. Investments in Human Capital not only affect Human Capital *per se* but it can be recognized that an investment can lead to added value in the other factors of production.

By understanding the importance of Human Capital, nations have made and effort to measure their Human Capital Stock. Thereafter

information on Human Capital becomes an important factor in determining policies. The main issue is that Human Capital is an abstract concept that cannot be easily measured. Instead it is generally approximated with the use of proxies.

Determining which proxies to use becomes a controversial topic. In 2009 during the OECD 3rd World Forum on "Statistics, Knowledge and Policy" it was debated which was the appropriate way to approach Human Capital measurement (Professor Kwon). Other studies and discussions have provided further depth into what should be considered as indicators of Human Capital. So by no means are the variables proposed in the paper fixed. They attempt to collect some of the different proxies and concepts found in literature and are thus subject to change.

3. Categories

3.1 Education

Human Capital is defined as the set of skills that inhabitants posses. The role of schools is to facilitate the attainment of such skills. It is therefore accepted to use years of education as a proxy to estimate Human Capital. Furthermore it has been showed that both basic and advanced skills are relevant to Human Capital Stock in a society. Subsequently, years of schooling ranging from primary to tertiary education is a proper way to measure Human Capital.

However, as explained by Eric A. Hanushek (Hanushek), there are some inadequacies with this proxy. The inadequacies mainly focus around the number of assumptions that this approach makes. Primarily it assumes that education has equal quality across countries. For instance it is assumed that a year of education in Norway is the equivalent of a year of education in Bolivia. Additionally it assumes that education systems are the same. Since this is not the case, he suggests that the proper way of measuring skillsets is by measuring competency.

Robert Barro and Jong Lee however showed that there was a strong correlation between cognitive skills (competency) and average years of education (Barro and Lee). Therefore it is still relevant to Human Capital to use education attainment as a proxy.

In light of these remarks it was decided that the sub-categories that make up the Education segment are; Average Years of Education and another set of variables that can discriminate the society by the level of education attained. These variables are the percentage of the total population that have completed a defined level of education, specifically primary, secondary and tertiary.

3.2 Health

Gary S. Becker explains the importance of considering Health as an key factor in measuring Human Capital. In his paper “Health as human capital: synthesis and extension” he discusses the expected

utility of life. It is important to remark that the expected utility of life is not constant in a society nor is it fixed for a person. Instead it is a function of age. The main point is that the more a person lives and is able to work during those years; the more that person can contribute to the welfare of a society.

Measuring the overall health of a society possesses several challenges. The biomechanical model of health tries to overcome those challenges by looking at the body as a machine (McDowell, Spasoff and Kristjansson). At its basic level the model assumes that the human body can be fixed when broken, just like a machine.

The model is not close ended and it accepts measurable parameters that can estimate of three main points. First, how often the body breaks down, second, the effectiveness of the system to fix the body and third, the general usefulness of the body. Due to the limited scope of this paper, it uses four of the variables proposed in the paper "On the Classification of Population Health Measurements" written by Ian McDowell, Robert A. Spasoff and Betsy Kristjansson.

The variables attempt to be representative of the complete biomechanical model described above. Specifically: environmental factors that affect the overall health of the population (CO_2 emissions per capita), social factors that determine the state of the Health System (expenditure on health per capita) and detrimental factors that impede the complete potential of humans to perform (homicides per 100,000). Additionally, life expectancy at birth was considered as a variable since

it encompasses many of the characteristics pertaining to the biomechanical model and it is one of the most important variables in the expected utility of life.

3.3 Income

Income plays a crucial factor in determining Human Capital. The reason is that Human Capital is being approximated by a combination of proxies from Education and Health. But proper access to Health as explained by Gary S. Becker has a cost and it is subject to the wealth of a person. Additionally attainment of Education is also costly and subject to the wealth of a person. (Wolff, Baumol and Saini).

Money is not the end but the means to an end. That is why many of the world wide used indices that try to determine the state of the population use income. The Human Development Index that was reported by the United Nations assigned one third of its weight to income. The Gender Development Index also reported by the United Nations is greatly determined by the income factor.

Additionally, it has been recognized in recent years that inequality is a crucial factor for Human Development. Since 2013 the United Nations began reporting the Inequality Adjusted Human Development Index and the Inequality Adjusted Index, which replaced the Human Development Index and the Income Index respectively. As understood by United Nations; lack of accessibility to education and health can play a detrimental factor in Human Development. Imagine the case of a

nation with a high Gross National Income per Capita but with high inequality. In the example by looking only at the GNI per Capita one could expect high levels of Education attainment. But since the distribution is highly unequal then the percentage of the population able to surpass the cost of education is smaller. This, as explained in the Education section is detrimental to the development of Human capital.

To estimate the income components two sub-categories have been selected. First the Income Index as reported by the United Nations and Second the GINI coefficient also reported by the United Nations.

3.4 Multidimensional Human Capital Index

In order to understand the current global situation it is important to measure the dimensions to which countries are deprived of Human Capital. This approach is based of Multidimensional Poverty Index used by the United Nations.

The Multidimensional Poverty Index (MPI) is a helpful tool that helps policy designers visualize the degree of poverty pertaining to a specific group. The versatile design of the MPI allows discriminating by region, ethnicity or any other category as well as by dimensions. Similarly the Multidimensional Human Capital Index can focus on a specific world region, and if enough information is attained it can provide insight into specific ethnic groups and the deprivation of Human Capital among those (United Nations).

Another important characteristic of this approach is that it can provide helpful understanding on the world's development. By looking at the trend of the MHCI over time, policy makers can see which policies have been effective and which policies have not. For instance the World Trade Organization or the United Nations can see which policies have increased Human Capital stock in the world (United Nations).

3.5 Weighted Average Index

There are several limitations by looking only at the MHCI because it only provides information on the overall worldwide situation. A weighted average index provides further variation at a country-specific scope. Such variation can give insight into what is the distribution of Human Capital Stock.

4. Methodology

4.1 Data Collection

In order to be consistent across the analysis and avoid bias both indices where constructed using the same data sets. The data was extracted from three different sources: the World Data Bank, the 2014 Human Development Statistical Tables and the educational data set developed by Barro and Lee. The World Data Bank is an international cooperative institution made up of 188 countries. The Bank holds multiple data sets for various categories. It is a reputable source and currently feeds data to other important organizations including the United Nations (The World Data Bank). The United Nations generates an

annual report on human development. The data used to generate such report is kept and maintained by the United Nations online, the latest version being the dataset that includes the 2014 statistics (The United Nations). Finally, Barro and Lee have developed an important data set and a working paper on the educational levels across countries named; "A new data set of educational attainment in the world, 1950–2010"(Barro and Lee).

Even though the data available spanned multiple years, all the data was collected for 2005. This year chosen arbitrarily and all the values (where applicable) where converted into 2005 present value. On some occasions the data given was already in 2005 US dollars. The data was collected across 41 different countries for all 10 specified sub-categories. An important remark is that in 2005 many countries had not begun reporting on inequality.

The data was then normalized between 0 and 1 using the following formula

$$Score = \frac{Initial\ Value - Min\ Value\ from\ set}{Max\ Value\ from\ set - Min\ Value\ from\ set}$$

In this way all the categories would have the same scale and could be added when using the weighted average index. This method was applied to the following variables: average years of schooling, CO_2 emission per capita, homicides (per 100,000), expenditure on ealth per capita and life expectancy at birth.

The GINI index and the Income index are already given in a format between 0 and 1 so normalization was not applied.

Finally for the percentage of population who have completed primary education, percentage of population who have completed secondary education and percentage of population who have completed tertiary education, the variables were given on a scale from 0 to 100. So the variables where divided by a 100 instead of applying the normalization technique.

4.2 MHCI[1]

To identify a Human Capital deprived country the scores for each category are summed up to obtain a deprivation score D. A country is defined as deprived if it scores 1/3 or more. This is the equivalent of being fully deprived in one category.

The score for each category is calculated by assigning thresholds (T) and weights (W) to each sub-category[2]. Specifically the weights and thresholds assigned are summarized in table 1. Subsequent justification will be addressed in the Thresholds section.

Table 1.

Categories	Sub-categories	Weights	Thresholds

[1] The Multidimensional Human Capital Index was constructed based of the MPI index reported by the United Nations.
[2] The Weights for each class are set to be all the same and equal to 1.
[3] Constructing the MHCI in an Excel document or other software tool makes
[2] The Weights for each class are set to be all the same and equal to 1.

Education	Total Completed Primary	1	90%
	TCS	1	45%
	TCT	1	20%
	Avg. Years of Total Schooling	1	90%
Health	CO2 Emissions per capita	1	7%
	Homicides (per 100,000)	1	13%
	Expenditure on Health per capita	1	1%
	Life Expectancy at birth	1	62%
Income	GINI	1	41%
	Income Index	1	47%

Table 2. presents and example for country X with the following normalized values (V)

Table 2.

Categories {i}	**Sub-categories {j}**	**Country X Original Values {V}**
Education	Total Completed Primary	0.75
	TCS	0.50
	TCT	0.15
	Avg. Years of Total Schooling	0.70
Health	CO2 Emissions per capita	0.10
	Homicides (per 100,000)	0.10
	Expenditure on Health per capita	0.01
	Life Expectancy at birth	0.70
Income	GINI	0.40
	Income Index	0.50

If Country X is deprived for a specific class then a value of 1 is assigned. Alternatively if a country is not deprived the value is 0.

Thereafter Country X would have the following deprivation matrix:

Sub-categories {i}	**Country X score {S}**
Total Completed Primary	1
TCS	0
TCT	1

Avg. Years of Total Schooling	1
CO2 Emissions per capita	1
Homicides (per 100,000)	0
Expenditure on Health per capita	1
Life Expectancy at birth	0
GINI	0
Income Index	0

Notice however that the inequality depends on the class. That is because on some sub-categories it is better to be above the thresholds and on others it is better to be bellow. For instance Country X is bellow con the total percent of the population that completes primary therefore it is given a 1 for this category. However is scores above in CO2 emissions per capita but it is still given a score of 1. This is because the "ideal" status is to emit less CO2 than the threshold.

The score for each category is calculated by summing up; all the values of each class under that category, and then dividing by the sum of the weights for each class under a specific category. If a country scores 1 it means it is deprived I all sub-categories, inversely if it scores 0 it is not deprived in any of the sub-categories.

$$Score\ Category_i = \frac{\sum_j s_{ij}}{\sum_j wij}$$

So for country X the score for each category is as follows

Education	0.75
Health	0.5

Income	0

The final score is calculated by adding the weighted score for each category. It is the standard to assume that each category contributes 1/3 to the total. Thus in this case the total score would be 41.6

$$Total\ Score\ Country\ X\ (D_z) = \frac{0.75 + 0.5 + 0}{3}$$

As stated previously a country is consider as deprived if it has a score of 1/3 or more. In this case country X is deprived.

Then MHCI is the calculated by summing each countries deprivation score and dividing by the total number of countries.

$$MHCI = \frac{\sum_{Z=0}^{N} Dz}{N}$$

4.3 WAI

The Weighted Average Index was calculated by adding the contribution of each category. Each category contributes 1/3, thus:

$$WAI_{Country\ Z} = \left(\frac{1}{3}\right) Education_Z + \left(\frac{1}{3}\right) Health_Z + \left(\frac{1}{3}\right) Income_Z$$

The value for each category is the sum of weighted score for each class. Thus for Country Z:

$$Category\ Score_i = \frac{\sum_j S_{ij}}{\sum_j W_{ij}}$$

Additionally, all variables have to be converted so their qualitative interpretation means the same. CO2 emissions per capita, homicides per 100,000 and GINI coefficient are looked at in the opposite way. Instead of 1 meaning high development it means low development. In order to fix this the variables are inverted such that:

$$New\ Value = 1 - Old\ Value$$

Look at countries X example again:

Table 2.

Categories {i}	Sub-categories {j}	Weights	Country X Original Values {V}
Education	Total Completed Primary	1	0.75
	TCS	1	0.50
	TCT	1	0.15
	Avg. Years of Total Schooling	1	0.70
Health	CO2 Emissions per capita	1	0.10
	Homicides (per 100,000)	1	0.10
	Expenditure on Health per capita	1	0.01
	Life Expectancy at birth	1	0.70
Income	GINI	1	0.40
	Income Index	1	0.50

The value for Education would be:

$$Education = \frac{0.75 + 0.5 + .15 + .70}{1 + 1 + 1 + 1} = .53$$

Education	0.53
Health	0.23
Income	0.90

$$WAI_{Country\ Z} = \left(\frac{1}{3}\right).53 + \left(\frac{1}{3}\right).23 + \left(\frac{1}{3}\right).90 = .55$$

Unlike the MHCI the WAI is not summed for countries therefore, it provides a point of comparison between countries.

5. Thresholds

The following are the set justifications for the selected thresholds. As described previously the thresholds mark minimums or maximums. On some circumstances it is "ideal" to be above and on some it is "ideal" to bellow. The thresholds attempt to be representative of such minimums or maximums. The thresholds proposed are not to be taken as fixed. Instead they try to be representative of what a countries level ought to be in 2005. [3]

[3] Constructing the MHCI in an Excel document or other software tool makes changing the thresholds relatively easy. Thereafter several analyses can be run in minutes. So analyzing the MHCI under different thresholds should be a relatively easy task.

5.1 Total Population Completed Primary, Secondary and Tertiary Education

In the 1999 the millennium development goals reported that the average number of people enrolling in primary education was 82% (United Nations). This threshold provides a basic idea of where the world is, thus it is a good starting point. Additionally it allowed a 6-year buffer for any advances in education to be considerable.

Thereafter it has been noted that the enrolment in further education tends to increase dramatically in developing countries especially for tertiary education. This drop in enrolment tends to be not so dramatic for secondary enrolment in developed countries. It has been noted that the general trend seems to be that each additional level of education receives half of the previous education level enrolment (Ontairo Ministery of Education). Consequently threshold for secondary is 40% and 20% for tertiary.

Again this last two are very rough estimates and there exists no good definition for what deprivation should be considered. From a utopian perspective the thresholds should be 100% each but this would be very aggressive and all countries would be deprived.

5.2 Average Years of Schooling

The expected average years of schooling should be the sum of all the expected years of schooling. The OECD defines: Primary Schooling as the first 6 years of schooling, Secondary as the subsequent 4 years of

schooling and Tertiary as the final 2 years of Schooling (OECD). In aggregate the average years of schooling should be 12. Since this variable was normalized in the index, the threshold has to be normalized to be valid. The normalization yielded 90%.

5.1 CO2 Emissions Per Capita, Homicides (per 100,000), Life Expectancy at Birth

There is no considerable or defining literature to determine at what point a country is deprived for the following variables: CO2 Emissions Per Capita, Homicides (per 100,000) and Life Expectancy at Birth. The real threshold should base on an ideal situation where CO2 Emission is 0, no one is murdered and people are expected to live for a long time. But setting these as thresholds is a very aggressive approach and all countries would be deprived.

The approach adopted then is to compare the world against itself in the past. To allow time for lag 2000 was chosen as the base year. The thresholds are the averages for the given category in this year:

CO2 Emissions Per Capita: Average (4.72), Normalized (0.07)

Homicides (per 100,000): Average (8), Normalized (0.002)

Life Expectancy at Birth: Average (67), Normalized (0.62)

GINI: Average (41%), Threshold is already normalized.

5.2 Expenditure on Health per Capita

According to the Commission of Macroeconomics and Health determined that countries should invest USD 34 to provide the basic coverture of health services. (World Health Organization). This is a very conservative threshold since it only accounts for basic coverage. After normalization the threshold is 0.002

5.3 Income Index

In the Human Development Reports the United Nations defines different thresholds for the Indexes it report. For the 2005 Income Index the United Nations defined the threshold for Low Human Development as 0.468. This variable was not normalized hence the thresholds does not need to be transformed. (United Nations).

6. Estimates for the MHCI and WAI

6.1 MHCI

Table 3 shows the per country sum of depravations. The cut off was set at 1/3 of the summed values. With this cutoff the estimate for the Multidimensional Human Capital Index was 31.5 %. This means that 31.5 % of the word is deprived of adequate Human Capital stock. If we

relaxed the cutoff where any country that had some degree of deprivation counted then the total world deprivation would be 41.5 %, 10 points higher.

The individual contribution to the index is as follows:

Education contributes 56.1 % of the deprivation.

Health Contributes 15. 5 % of the deprivation.

Income contributes 28.4% of the deprivation.

So Deprivation in term of education is the most influential factor in the aggregate human capital stock. It contributes more than the other two factors combined. If we relax the thresholds by lowering them by 10% then the MHCI drops to 23.6% the individual contribution however doesn't change significantly. Education still contributes 52.6% of the total deprivation.

6.2 WAI

Figure 1 shows the distribution of the WAI per country. The distribution seems to uniformly allocate countries. There does not seem to be any group of disproportionately intensely deprived countries. Instead countries seem to increase their Human Capital Stock linearly. The lowest point is at 34.2% and the highest is at 69.9%.

Figure 2 plots the WAI against the GNI of each country. In order to plot this we have to make the assumption that GNI per capita is proxy for production under a Cobb Douglass production curve. Thus using the logarithmic transformation we can measure the fit by comparing the WAI against the LN (GNI per capita) (Remolina, Martinez and Munoz). We see that there is a linear correlation between the WAI and the GNI per capita.

Figure 3 compares the three categories of the WAI. There is a clear relationship between the variables; they tend to increase together. That is as Education increases; Health and Income also increase. There is a clear difference however between Health and Income and Education. Health and Income are more closely related in both the values and the gradient displayed. On the other hand Education displays a different gradient. Especially with the more deprived countries Education seems to be the biggest part of the deprivation.

6.3 WAI and MHCI

Logic suggests that the countries that score the highest in the WAI are those countries that have the lowest depravation scores. Table 5 compares the WAI against the deprivations score for each individual country. Overall the trend seems to follow logic. Table 5 is ranked by the WAI in descending order, meaning that the country with the highest WAI sits at top and the country with the lowest sits at the bottom of the table.

At both ends of the table the trend follows logic Sweden is the country with the highest WAI and has the lowest value for the deprivation score. Alternately Niger has the lowest WAI and the highest deprivation score. However there are some recurring mismatches where countries with lower deprivation scores sit beneath countries with high deprivation score.

The mismatch can occur since a country can have very big values on some of the sub-categories and still be deprived in many. Thus the WAI is going to be inflated and the deprivation score is going to be high. This mismatch helps to show the importance of the dual index analysis. The flaws in one index can be corrected by the other thus helping clear the picture a little more.

7. Conclusions and Remarks

The analysis created two indices to examine the deprivation in the Human Capital Stock at a worldwide level. The first was the Multidimensional Human Capital Index. It measured the overall level of deprivation at a global scale. The second was the Weighted Average Index. This last measured each country overall level of Human Capital Stock.

By weighting each category and class equally it was found in the MCHI that the level of deprivation was 31.5%. Education was the biggest factor of deprivation and it contributed 56.1 % even when the

education thresholds where relaxed it was one of the most influential factors. Income was the next most influential factor accounting for 28.4% and last was health with 15. 5 %.

Again by weighting each category and class equally the WAI showed that there is a distribution in the Human Capital Stock across countries. This was expected, in general terms there seems to be a linear relationship in the Human Capital Stock. However looking closely it is evident that Education plays a crucial role. It follows a much steeper gradient than Health and Income. Thus for deprived countries the gap between Education and, Health and Income is bigger than the same gap in less deprived countries.

Overall it becomes clear that the biggest deprivation factor is Education. Especially in the most deprived countries, Human Capital Stock is greatly diminished by lack of complete Education. It is strongly suggested that programs worldwide focus on fomenting populations to increase the percentage of people that complete education levels. This conclusion is based on the variables used that measured the level at which a population has achieved education level, and Robert Barro and Jong Lee findings which correlate cognitive skills (competency) and Average years of education (Barro and Lee).

An important remark is that the study only comprises 41 countries for which reputable sources provided the data. A deeper more complete analysis, which could provide further insight, should be based on more countries.

Additionally it has been noted that in the last 5 years the United Nations began including inequality in their reports. The Human Development Index was changed for the Inequality Adjusted Human Development Index and the Income Index for the inequality adjusted index. This paper only examined one degree of inequality expressed in the GINI coefficient. However more degrees of inequality can be observed in almost all categories. For instance expressed as access to education. A further analysis that incorporates this aspect would also include light on how Human Capital is distributed at a global scale.

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9. Appendix

Table 3. Shows the weighted deprivation and the sum for each country.

	Education	Health	Income	Sum of Deprivation
Albania	0.75	0	0	0.25
Argentina	0.75	0	0.5	0.42
Armenia	0.5	0	0	0.17
Bangladesh	1	0.25	0.5	0.58
Bolivia	0.75	0.25	0.5	0.5
Brazil	1	0	0.5	0.5
China	1	0.25	0.5	0.58
Colombia	1	0.25	0.5	0.58
Costa Rica	1	0	0.5	0.5
Czech Republic	0.25	0.25	0	0.17
Ecuador	1	0.25	0.5	0.58
El Salvador	1	0.25	0.5	0.58
Estonia	0.25	0.5	0	0.25
France	0.5	0.25	0	0.25
Gabon	1	0.25	0.5	0.58
Honduras	1	0.25	0.5	0.58
Hungary	0.5	0.25	0	0.25
India	1	0.25	0	0.42
Indonesia	1	0	0	0.33
Israel	0.5	0.25	0.5	0.42
Kazakhstan	0.5	0.75	0	0.42
Kenya	1	0.5	1	0.83
Lithuania	0.5	0.25	0	0.25
Mexico	1	0.25	0.5	0.58
Nicaragua	1	0.25	0	0.42
Niger	1	0.5	1	0.83
Pakistan	1	0.5	0	0.5
Panama	0.5	0.25	0.5	0.42
Paraguay	1	0.25	0.5	0.58
Peru	0.25	0.25	0.5	0.33
Poland	0.5	0.25	0	0.25
Romania	0.5	0.25	0	0.25
Russian Federation	0.25	0.5	0	0.25
Senegal	1	0.25	0.5	0.58
Serbia	0.5	0	0	0.17
Slovenia	0.5	0.25	0	0.25
Sweden	0.25	0.25	0	0.17
Tunisia	1	0	0	0.33
Turkey	1	0	0.5	0.5
Ukraine	0.25	0.25	0	0.17
Uruguay	0.75	0	0.5	0.42

Table 4 Weighted Average Index Values

Country	Education	Health	Income	WAI
Niger	0.06	0.58	0.39	0.34
Senegal	0.04	0.62	0.42	0.36
Kenya	0.28	0.57	0.46	0.44
Pakistan	0.28	0.62	0.43	0.44
Bangladesh	0.30	0.65	0.38	0.45
El Salvador	0.36	0.44	0.56	0.45
India	0.33	0.62	0.43	0.46
Honduras	0.31	0.50	0.57	0.46
Nicaragua	0.31	0.64	0.47	0.47
Indonesia	0.34	0.66	0.48	0.49
Paraguay	0.40	0.62	0.56	0.52
Colombia	0.42	0.54	0.61	0.53
Tunisia	0.35	0.70	0.52	0.53
Gabon	0.40	0.62	0.59	0.54
China	0.42	0.68	0.51	0.54
Bolivia	0.45	0.62	0.58	0.55
Turkey	0.39	0.68	0.59	0.55
Ecuador	0.41	0.65	0.60	0.55
Albania	0.52	0.70	0.48	0.57
Uruguay	0.43	0.71	0.59	0.58
Brazil	0.40	0.70	0.64	0.58
Romania	0.56	0.68	0.52	0.59
Mexico	0.45	0.68	0.63	0.59
Costa Rica	0.47	0.72	0.59	0.59
Ukraine	0.70	0.62	0.47	0.60
Serbia	0.57	0.71	0.52	0.60
Peru	0.59	0.65	0.57	0.60
Argentina	0.51	0.70	0.60	0.61
Kazakhstan	0.74	0.57	0.51	0.61
Panama	0.53	0.69	0.61	0.61
Armenia	0.68	0.69	0.48	0.62
Lithuania	0.65	0.65	0.57	0.62
Estonia	0.70	0.64	0.57	0.63
Poland	0.66	0.70	0.56	0.64
Russian Federation	0.71	0.62	0.58	0.64
Hungary	0.67	0.72	0.55	0.64
Czech Republic	0.71	0.72	0.54	0.66
Slovenia	0.68	0.76	0.54	0.66
France	0.59	0.83	0.60	0.67
Israel	0.66	0.76	0.63	0.68

Sweden	0.69	0.83	0.58	0.70

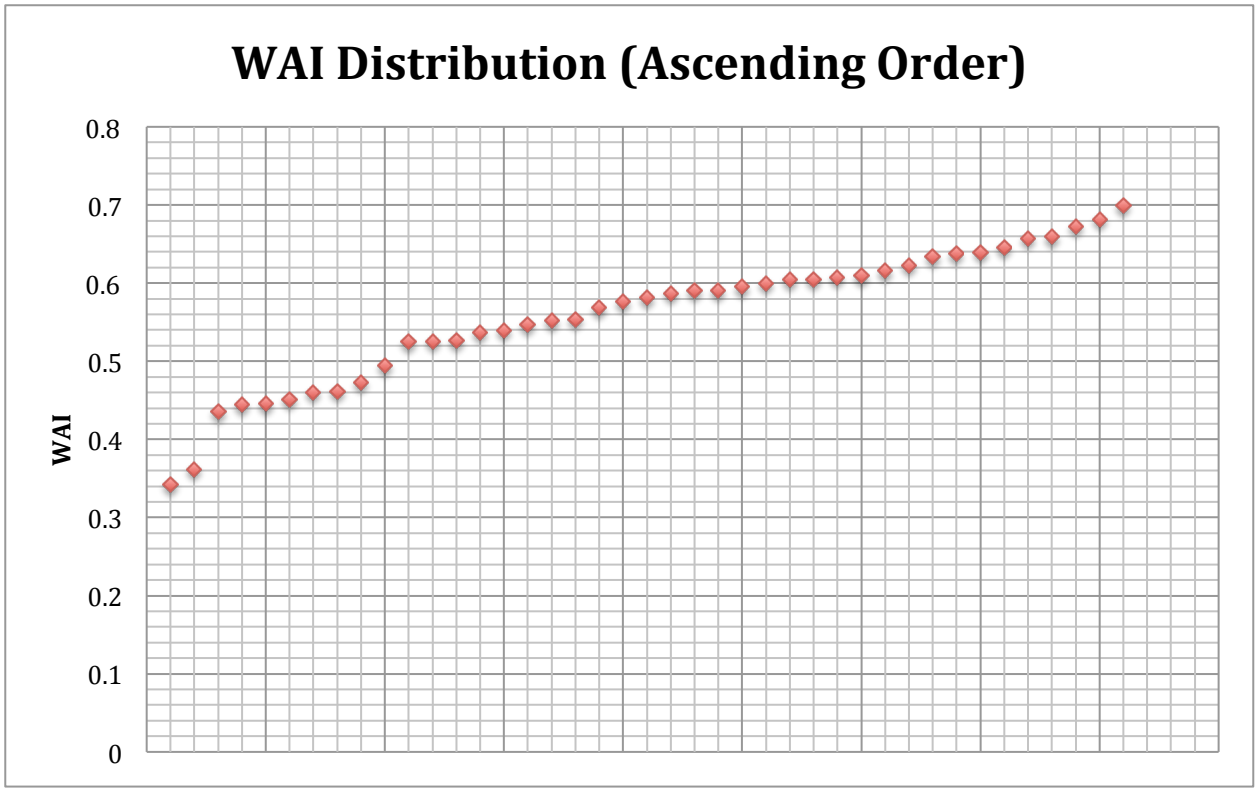

Figure 1. Plot of the WAI for each country in ascending order.

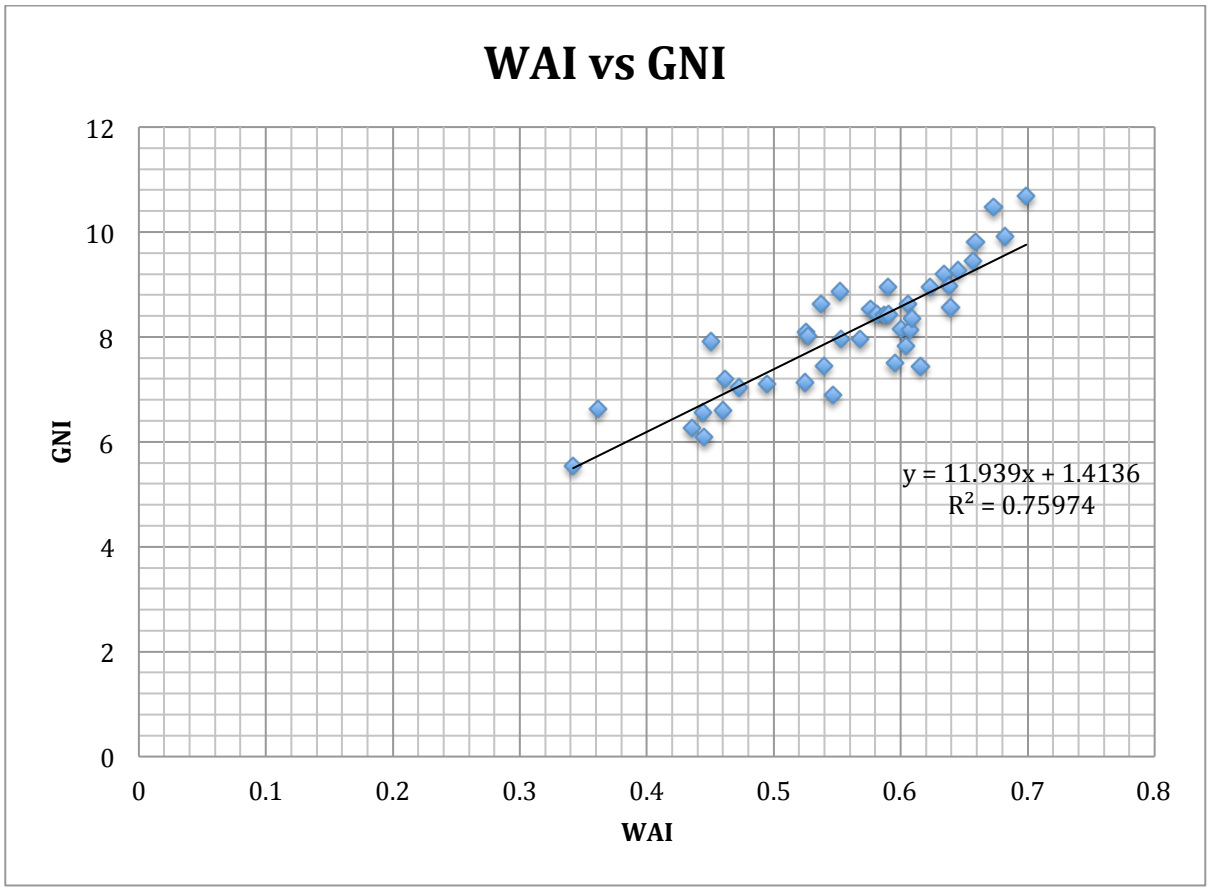

Figure 2. Plot of the WAI for each country against the GNI

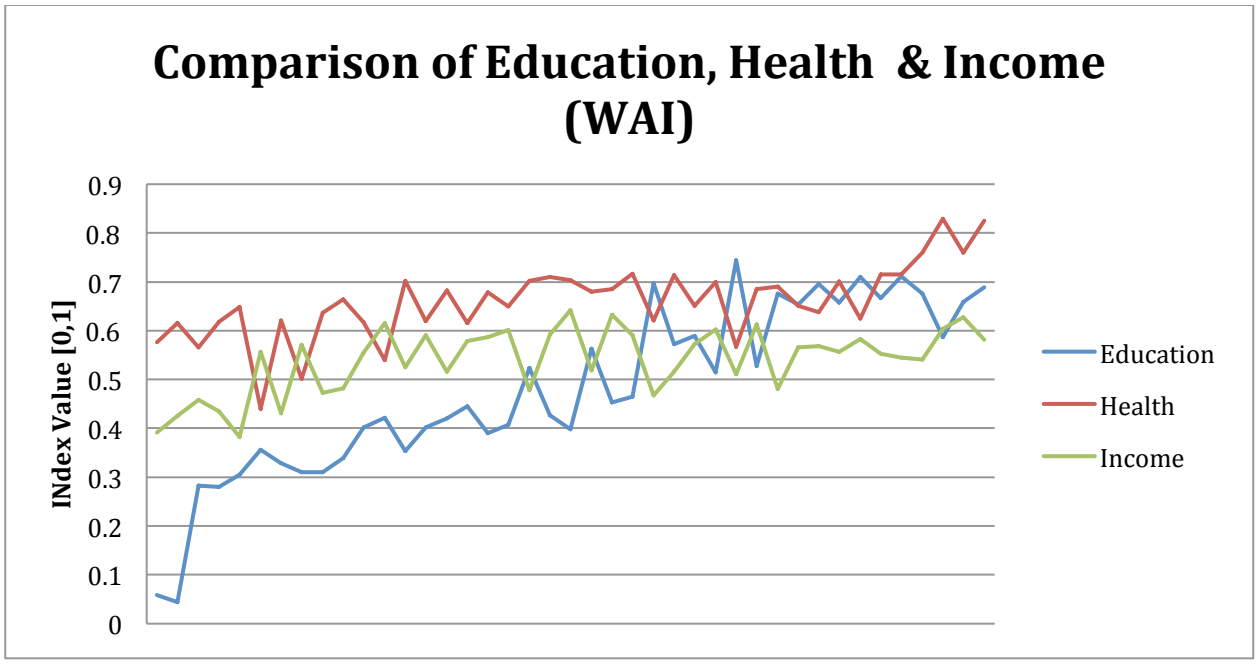

Figure 3. Plot comparing the 3 components of the WAI, they are ordered in the in the ordered presented in table 4.

Table 5 WAI against the sum of deprivation (Ranked by WAI)

Country	WAI	Sum of Deprivation
Sweden	0.70	0.17
Israel	0.68	0.42
France	0.67	0.25
Slovenia	0.66	0.25
Czech Republic	0.66	0.17
Hungary	0.64	0.25
Russian Federation	0.64	0.25
Poland	0.64	0.25
Estonia	0.63	0.25
Lithuania	0.62	0.25
Armenia	0.62	0.17
Panama	0.61	0.42
Kazakhstan	0.61	0.42
Argentina	0.61	0.42
Peru	0.60	0.33
Serbia	0.60	0.17
Ukraine	0.60	0.17
Costa Rica	0.59	0.50
Mexico	0.59	0.58
Romania	0.59	0.25
Brazil	0.58	0.50
Uruguay	0.58	0.42
Albania	0.57	0.25
Ecuador	0.55	0.58
Turkey	0.55	0.50
Bolivia	0.55	0.50
China	0.54	0.58
Gabon	0.54	0.58
Tunisia	0.53	0.33
Colombia	0.53	0.58
Paraguay	0.52	0.58
Indonesia	0.49	0.33
Nicaragua	0.47	0.42
Honduras	0.46	0.58
India	0.46	0.42
El Salvador	0.45	0.58
Bangladesh	0.45	0.58
Pakistan	0.44	0.50
Kenya	0.44	0.83
Senegal	0.36	0.58
Niger	0.34	0.83